Attachment C to Reply Comments (Part II)

JAR Exhibit 2

Implementation of Both the DCF Method and the Risk Premium/CAPM Method

JAR EXHIBIT 2

Implementation of the DCF Method and the Risk Premium/CAPM Method

I. DCF Method

Q. HOW IS THE DCF METHOD USUALLY IMPLEMENTED?

A. The DCF method is usually implemented in utility rate proceedings using the constant growth version. It is applied by implementing the following formula:

> cost of equity = dividend yield + future expected growth
>
> Where growth refers to the future sustainable growth rate in dividends, earnings, book value and stock price.

Q. IS THE DCF MODEL WIDELY USED IN UTILITY RATE PROCEEDINGS?

A. Yes. The DCF model has been widely used for many years. From my experience, the constant growth form of the DCF model is more widely used than any other approach to determining the cost of equity.

Q. IS THE DCF MODEL COMMONLY IMPLEMENTED IN A CONSISTENT MANNER?

A. No. The DCF model is widely used and widely abused. Most implementations of the DCF model in utility rate proceedings start out with the same D/P +g, or dividend yield plus growth formula. Also, most generally agree that the growth rate "g" must be representative of the constant future growth rate anticipated by investors for dividends, earnings, book value, and stock price. However, all too often, this important principle is forgotten when it comes time to implement the constant growth DCF formula. Such carelessness causes substantial, unnecessary error when implementing the constant growth version of the DCF model.

Q. WHY IS IT SO IMPORTANT FOR THE GROWTH RATE USED IN THE CONSTANT GROWTH VERSION OF THE DCF MODEL TO BE REPRESENTATIVE OF THE CONSTANT GROWTH RATE FOR DIVIDENDS, EARNINGS, BOOK VALUE AND STOCK PRICE?

A. The derivation of the constant growth formula is based upon the principle that investors buy stock solely for the right to future cash flows obtained as a result of that ownership. The cash flows are obtained through dividend payments and/or stock price appreciation. The constant growth version of the DCF formula will accurately quantify investors' expectations only if investors expect the dividend yield (defined as dividend payment divided by stock price) and the growth in dividends to best be estimated at one constant growth rate for many years into the future. The dividend yield and growth rate that are used in the constant growth formula must be selected carefully. Consider what happens if the expected growth rates are not all equal:

1. DIFFERENT GROWTH RATE FOR EARNINGS AND FOR

DIVIDENDS. Both dividends and the ability for a company to grow dividends in the future are directly derived from earnings. The dividend yield, or D/P, portion of the constant growth DCF formula quantifies the investor-derived value from the portion of earnings paid out as a dividend and the "g" portion of the constant growth DCF formula quantifies the value of the portion of earnings retained in the business. If dividends are quantified using the current dividend rate, but an earnings forecast is used to quantify "g" that is based upon a future environment in which earnings are expected to grow more rapidly than dividends, an ever-increasing portion of the total return expected by investors will be attributable to growth and a smaller portion will be attributable to dividends. Under these conditions, other things being equal, the constant growth version of the DCF model would overstate the cost of equity because the decrease in the payout ratio that results from a more rapid earnings growth rate than dividend growth rate would shift a greater portion of the earnings from dividends to earnings growth. The result of this is that the higher future earnings growth rate would cause the portion of earnings available for dividends to be lower, and therefore the dividend yield would be lower. Conversely, if future earnings growth were expected to be less than dividend growth, the constant growth form of the DCF model would understate the cost of equity. Every time a dividend payment is scheduled, the board of directors of a company decides what portion of earnings to pay out as a dividend and what portion of earnings to re-invest, or “retain” in the business. It is this re-investment of earnings that causes sustainable growth. Both dividends and growth therefore compete for the same dollars of earnings. The higher the portion of earnings allocated to the payment of dividends, the smaller the amount of earnings left over for re-investment and therefore the lower the future growth rate. The relationship between the portion of earnings paid out as a dividend and the portion re-invested in the business is commonly referred to as either the dividend “payout” ratio (which is computed by dividing dividends by earnings), or the “retention rate” (which is computed by dividing the portion of earnings re-invested in the business by earnings). The sum of the payout ratio and the retention rate is 1.0, or 100% because 100% of earnings are either paid out as a dividend or retained in the business. The constant growth version of the DCF formula uses a specific dividend rate to compute the “D/P” term of its formula. This specific dividend rate has specific earnings “retention rate” associated with it. This specific “retention rate” provides for one and only one percentage of earnings that remains to cause the growth that is quantified in the second term of the equation. This is because the portion of earnings paid out as a dividend and the portion not paid out as a dividend must remain equal to total earnings. Consider what happens if the dividend “payout ratio” or the earnings “retention” ratio are not constant. If they are not constant, the portion of earnings available for growth and the portion available for dividends will continue to shift over time, but under such conditions the constant growth formula produces an erroneous result because it is incapable of properly accounting for this change.

2. EARNINGS PER SHARE GROWTH RATE DIFFERENT FROM STOCK PRICE GROWTH RATE. When earnings per share growth rates are measured over a relatively short time period such as the five-year consensus growth rates compiled by services such as Zacks and I/B/E/S, it is likely that investors expect materially different growth rates in earnings per share and stock price. This is because the earnings per share growth rate as reported in such services is simply the compound annual growth rate in the earnings per share from the most recently completed fiscal year to the earnings per share forecast for five years into the future. Presumably, an earnings per share forecast for five years into the future is sufficiently far off that analysts' forecasts for that time period must be based upon an expectation of normal conditions. Five years into the future is too far off to forecast abnormal economic conditions, abnormal weather conditions, or any abnormal operating problems that could impact earnings. However, the base year from which earnings are forecast is likely to contain some abnormalities that have an impact on earnings. To the extent this abnormality exists, the forecast of earnings per share growth from the base year to a period five years in the future will be equal to thc sustainable growth rate plus or minus the impact of any abnormalities. Growth that is required to bring

earnings up to or down to normally expected conditions is not sustainable growth and therefore it is not the kind of growth that would be mirrored in the stock price growth rate.

3. DIFFERENT GROWTH RATE FOR EARNINGS AND FOR BOOK VALUE. The return on book equity is computed by dividing earnings by book value. This is an important number for several reasons: a) for a regulated utility company, the allowed cost of equity is the return on book equity that a utility commission intends for a company to earn on the regulated portion of its business, and b) unregulated companies attempt to earn the highest risk adjusted returns on equity that are possible. If earnings per share grow more rapidly than book value per share, the return on equity increases. Conversely, if earnings per share grow more slowly than book value per share, the return on equity decreases. While increases and/or decreases in the earned return on equity can and do occur, it is not credible to forecast a sustained change in the return on equity for the many years into the future that are required in the constant-growth DCF model. A forecasted continuation of a decrease in the earned return on equity would eventually drive the earned return on equity to near zero – a condition that is not credible for a regulated business providing a needed service. Similarly, a forecasted continuation of an increase in the earned return on equity would eventually drive the earned return on equity to an extremely

high number – a condition that would not form the basis for a credible growth rate forecast for a regulated business because of the regulatory constraints on the authorized return. Similarly, an earnings per share growth rate higher than the book value per share growth rate is not credible for a competitive business because, as returns would go higher and higher, more and more competitors would be attracted. If a growth rate based upon an earning per share forecast higher than the forecast book value per share growth rate were used in a constant-growth form of the DCF model, then the constant-growth version of the DCF model would contain an upward bias. Conversely, if an earnings per share forecast that is lower than the book value per share growth rate, then the constant-growth form of the DCF model would contain a downward bias.

Q. ARE FIVE-YEAR EARNINGS PER SHARE FORECASTS OF THE TYPE AVAILABLE FROM SOURCES SUCH AS ZACKS, I/B/E/S, AND VALUE LINE SUITABLE AS A PROXY FOR LONG-TERM SUSTAINABLE GROWTH IN THE CONSTANT-GROWTH FORM OF THE DCF MODEL?

A. No. For the above reasons, it is improper to directly use a five-year earnings per share forecast as a proxy for long-term sustainable growth in the constant-growth DCF model. No attempt is made for these earnings per share forecasts to be representative of the anticipated growth rate in dividends per share, book value per share, or stock price. Therefore, these sources can be used to develop a sustainable growth rate in the context of a constant-growth DCF model, but if used directly as a proxy for long-term growth they are no more accurate than it would be to forecast the height of a human at age 60 based upon a reasonable forecast of annual growth for the five years starting at age 12. These earnings per share forecasts are generally different from the anticipated growth in dividends, book value, and stock price because they include the often substantial impact of bringing earnings up or down to a normal earned return on equity from whatever return on equity was achieved in the most recently completed fiscal year. Additionally, such analysts' growth rates tend to be overstated because of the well-documented propensity for analysts to be optimistic.[7] The combined effect of the habitual optimism and the required movement over a relatively short five-year time period to bring earnings per share up to the optimistic levels causes five-year analysts' growth rates to commonly overstate the future sustainable growth rate. As noted earlier, an October 4, 2001 report issued by Credit Suisse First Boston noted that analysts' estimates "... have on average been 6% too optimistic 12 months prior to a reporting date."[8] As a result, DCF approaches that rely upon the direct use of analysts' five-year growth rates repeatedly overstate the cost of equity.

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[7] While there are many sources that have shown this optimism to exist, one noteworthy source is a statement by Arthur Levitt, former chairman of the U.S. Securities and Exchange Commission. The following appeared on page 4 of the 5/31/99 issue of Barrons:

> ARTHUR LEVITT MAY BE THE best chairman of the SEC since Joe Kennedy. And no accident, really: Like Kennedy, Levitt spent enough time in the Street to develop a fine nose for good stocks and bad people.
>
> Back in April, Levitt delivered some cogent remarks on analysts (in the sacred order of being, they're somewhat lower than angels) and their innate bullishness (solely the product of their sunny natures).
>
> As he observed, sell recommendations make up 1.4% of all analysts' recommendations, while buys represent 68%.
>
> By way of explanation for this strange imbalance, he offers the possibility of a "direct correlation between the content of an analyst's recommendation and the amount of business his firm does with the issuer."
>
> Analysts, he grouses are too eager to see every frog of a stock as a prince. What the world needs, he laments, are analysts who call a frog a frog.

Q. HOW IS IT POSSIBLE TO ENSURE THAT THE GROWTH RATE USED IN THE CONSTANT-GROWTH VERSION OF THE DCF MODEL WILL RESULT IN A CONSTANT GROWTH RATE INDICATOR FOR DIVIDENDS, EARNINGS, BOOK VALUE, AND STOCK PRICE?

A. The most straight-forward and most accurate way to make this computation is to use the formula "b x r + sv" formula, where b= the earnings retention rate, r = the future expected return on book equity, and sv is a factor that accounts for sustainable growth caused by the sale of new shares of common stock. The mathematics in support of the derivation of the DCF model show that the "b x r + sv" formula should be used to quantify sustainable growth. Common mistakes with this formula include using historic values of "b x r" and/or of "sv" rather than future expected values, and most importantly by failing to realize that in order for the formula to be applied properly, the retention rate value, "b" must be determined in a manner that is consistent with the other values input into the DCF model. This is a critical step necessary to ensure that the portion of the future expected earnings that have been allocated to dividends is consistent with the future expected earnings level that is used to compute growth. This is the way to be sure that the retention rate used to compute the dividend yield portion of the constant-growth portion of the DCF model is the same as the retention rate used to compute growth. If the two are not equal, then the total amount of future expected earnings allocated in aggregate to dividends and to growth will be something other than 100% of earnings. An approach that accounts for something other than 100% of earnings in the cost of equity computation will result in an invalid result.

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[8] *Weekly Insights*, "Global Strategy Perspectives", October 4, 2001, page 58.

The way to ensure the consistency necessary for a valid result from the implementation of the constant-growth form of the DCF model is to compute the retention rate "b" based upon the inputs used for the dividend rate "D" and the future expected return on equity, "r". This computation is straight-forward. By definition the retention rate "b" is equal to the portion of dividends not paid out as a dividend divided by earnings. The earnings consistent with the value used for "D" is computed by multiplying book value as of the time of the determination of "D" by the value of "r". The result is the future expected rate of earnings that is consistent with the value used for "D". By subtracting "D" from the future expected earnings consistent with the value used for "r" and dividing that amount by the earnings consistent with the value chosen for "r" results in a retention rate that contains the necessary consistency. If any other value for "b" is used, such as a forecasted value for "b" in some future time period, then the result from the constant-growth DCF computation would be invalid.

Q. HOW DID YOU APPLY THE DCF MODEL IN THIS CASE?

A. I the DCF method two different ways. One way is a single-stage, or constant growth DCF model in which I added a growth rate that was carefully constructed to meet the rigorous requirements of the constant growth formula. The second DCF analysis is a multi-stage method, but I do not put much weight on the results of the multi-stage result because of the high return on equity (higher than I believe investors expect) in years 2002 to 2006. Both approaches to the DCF method are dependent upon an estimate of what common equity investors expect for future cash flow. Any company creates a future cash flow for its equity investors by investing funds in assets that are needed by its business. The future cash flow rate is therefore dependent upon the rate at which the funds invested by the equity investors is able to earn. The rate at which they are able to earn is referred to as the return on book equity.

Q. HOW DID YOU DETERMINE THE FUTURE RETURN ON BOOK EQUITY ANTICIPATED BY INVESTORS?

A. I examined both the historic actual returns earned on average by the comparative group of telecommunications companies and the future return on equity forecast by Value Line. I also considered the general pessimism in the telecommunications industry, and how rapidly Value Line's forecasted return on book equity is declining.

As shown on Schedule JAR Exhibit 5, Page 1, Value Line forecasts that, on average, the telecommunications industry will earn 6.5% on book equity in its October 4, 2002 issue. This is down from 12.0% when I filed my testimony in New Jersey last year, and down from 7.0% in Value Line's July 5, 2002 issue. As also shown, the Value Line expected return on book equity forecast for the comparative group of RBOCs is 17.83%, which is considerably less than the 23.85% earned on average by these companies in 2001. The return on book equity consistent with the Zacks' consensus growth rate was 17.24%. Just in the three months ended October 4, 2002, Value Line lowered the return on book equity it expects Verizon will earn in 2005-2007 from 22.0% down to 17.5%.

Q. HOW WOULD KNOWLEDGEABLE INVESTORS VIEW THE ABOVE DATA?

A. Knowledgeable investors would start by questioning if the forecasted earned return on equity from 2002 is possible in light of the difficulties in the telecommunications industry. In view of the well documented and widely publicized view that analysts tend to be overly optimistic about future earnings, and the knowledge that lower interest rates are likely to mean lower allowed return on equity in the future than were allowed in the past, most knowledgeable investors would not find the forecasted return on equity to be a credible estimate of the earned return on book equity level that is sustainable into the future.

As time passes and the telecommunications industry becomes more fully competitive, the return on equity earned by Verizon and the other RBOCs should become closer to that earned by the overall telecommunications industry. Averaging the 17.83% for the RBOCs with the 6.5% forecast for the industry produces 12.16%. To arrive at the future return on book equity used to compute sustainable growth, when comparing the growth expectations to the current stock price, I estimated that investors expect a future return on book equity of 13.00%. Since the expectations had been severely declining during the year, I used the much higher 16.0% when computing growth expectations consistent with the average stock price over the entire year.

Q. YOU SAID THAT ANALYSTS' ESTIMATES ARE WELL KNOWN TO HAVE A TENDENCY TO BE HIGH. PLEASE PROVIDE YOUR BASIS FOR THAT CONCLUSION.

A. In addition to the statements from former Securities Exchange Commission chairman Arthur Levitt, and the statements in a recent report from Credit Suisse First Boston that I have referenced earlier in this testimony, other noteworthy sources include an article that appeared on the first page of the September 3, 2001 issue of the Financial Times. This article, entitled "HSBC shakes up research" begins by saying:

> HSBC is radically restructuring its investment research in a sign that banks are responding to criticism of the quality of equity analysis.
>
> The bank's analysts will be required to publish as many "sell" recommendations on stocks as "buys" and HSBC will invest its own money in its best research ideas. The move is in response to criticism that investment banks' analysts are too positive about companies in the hope of generating lucrative corporate finance work.
>
> Criticism has been particularly strong in the US, where many banks continued to talk up technology shares at the peak of the market. The banks are facing a wave of litigation from investors who lost money by following analysts' recommendations. Merrill Lynch recently paid $400,000 to a client to drop an action against Henry Blodget, its star internet analyst.
>
> Banks have also been attacked by US regulators and politicians.

An article appeared in the November 18, 2001 edition of the New York Times, on the first page of the Sunday business section 3. This article, entitled

"Telecom's Pied Piper: Whose Side Was He On?" is an article about Salomon Smith Barney telecommunications analyst Jack Benjamin Grubman, "... one of Wall Street's highest-paid analysts...". The article then says:

> Anyone can make mistakes, but Mr. Grubman's cheerleading epitomizes the conflict-of-interest questions that have dogged Wall Street for two years: Even as he rallied clients of Salomon Smith Barney, a unit of **Citigroup**, to buy shares of untested telecommunications companies and to hold on to the shares as they lost almost all of their value, he was aggressively helping his firm win lucrative stock and bond deals from these same companies.
>
> Since 1997, Salomon has taken in more investment banking fees from telecom companies than any other firm on the Street. Because of Mr. Grubman's power and prominence, and because his compensation is based in part on fees the company generated with his help, a part of those fees went to him.

The demise of Enron has caused investors has served to substantially reinforce investors' mistrust of analysts. Consider the impact on investors when they read the article entitled "The Analyst Who Warned About Enron" that appeared on pages C1 and C17 of the 1/29/02 edition of the *Wall Street Journal*. The article explains that "Financial Analysts who tracked Enron Corp. have taken a pounding for being company 'shills' and for failing to concede they didn't fully understand the Houston energy-trading concern's complex finances." Then, the article explains one exception was bond analyst Daniel Scotto who told clients back in August that Enron securities "should be sold at all costs and sold now" Instead of his accurate recommendation resulting in him getting a promotion, it resulted in him being fired. As the article explains,:

> Mr. Scotto's experience highlights one of the oldest pressure points on Wall Street involving financial analysts, who traditionally act as a filter between investors and the financial markets. During the past decade, Wall

> Street securites firms increasingly have pushed their research analysts to actively trumpet stocks and bonds, not impartially analyze them.
>
> The side benefits to the securites firms can be enormous: If an analyst touts a company's securities, the securities firm stands a greater chance at becoming an adviser to that company, and garnering the fees that will follow. Nowadays, analysts can be stars, receiving bonuses of several hundred thousand dollars for helping their firm to win big underwriting deals. Bash the securities of a corporate client, though, and the securities firm could be shut out of lucrative deals. Enron issued billions of dollars worth of securities in recent years, generating huge fees for its financial advisers and bankers.

Because of articles like these, others that have appeared over the years, and knowledge gained from personal experience, knowledgeable investors know that analysts' forecasts have a strong tendency to be overly optimistic.

b) Implementation of Single-stage DCF

Q. HOW DID YOU IMPLEMENT THE SINGLE-STAGE OR CONSTANT GROWTH DCF IN THIS CASE?

A. I started by taking the current quarterly dividend rate for each company examined[9] and multiplying it by 4 to arrive at the current annual rate. This number was then converted to a dividend yield by dividing it by the stock price of each company. The stock price used was determined two different ways. One way was to take the actual stock price as of August 31, 2002. The second way was to take the average of the high and low stock price for the year ended August

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[9] The group of companies was selected by the company witness.

31, 2002. Then, the dividend yield was increased by adding one-half the future expected growth rate. This upward adjustment to the dividend yield is necessary because the DCF formula specifies that the dividend yield to be used is equal to the dividends expected to be paid over the next year divided by the market price. After this adjustment to increase the dividend yield, the yield is equal to an estimate of dividends over the next year. Each dividend yield was then increased to allow for dividend growth over the next year. This was accomplished by adding one-half the future expected growth rate to the current dividend. After the adjustment, the final dividend yield that I used is equal to an estimate of dividends over the next year.[10]

Q. HOW DID YOU OBTAIN THE GROWTH RATES YOU USED IN THE CONSTANT GROWTH, OR k= D/P + G, VERSION OF THE DCF METHOD?

A. I derived the growth rates from the internal, or retention growth rate, or "b x r" method where "b" represents the future expected retention rate and "r" represents the future expected earned return on book equity. In addition to the "b x r" growth caused by the retention of earnings, I added an amount to recognize that growth is also caused by the sale of new common stock in excess of book value.

A critical requirement in the implementation of the simplified version of the DCF model is that the estimate of the future expected growth rate be a growth rate that is expected to be sustained, on average, for many years into the future.

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[10] The complex version does not directly use dividend yields. Instead, it determines the present value of each dividend payment as a discounted cash flow.

Stock analysts and textbooks recognize that generally the most accurate way to estimate the sustainable growth rate in a constant growth DCF method is to use what is usually referred to as the retention growth, or "b x r" method. In this approach, the future expected retention rate "b" is multiplied by the future expected return on book equity "r" in order to obtain a sustainable growth rate. Other methods to estimate future sustainable growth are sometimes used. However, those methods are generally more subjective, and even if used with extreme care, do not have the same potential for accuracy that a properly applied "b x r" estimate has. In order to produce a meaningful result, whichever growth rate method is used in the constant growth version of the DCF method must be a constant growth rate. The non- b x r growth rate methods must be adjusted to eliminate factors which would otherwise cause them to include non-recurring influences on growth. Unless the growth rates obtained from these alternative methods are adjusted to make the result equally representative of the future average expected growth in earnings, dividends, book value, and stock price, they are invalid for use in the constant growth form of the DCF model.

The "b x r" method is best implemented by multiplying the *future expected* return on book equity by the retention rate that is consistent with both the future expected return on book equity and the dividend rate used to compute the dividend yield. Also, future sustainable growth should include an increment of growth to allow for the impact of sales of new common stock above book value.

The "b x r" growth rate computation, unless adjusted, does not account for sustainable growth that is caused by the purchase or sale of common stock above book value. Therefore, I modified the "b x r" growth rate to account for this additional growth factor. This additional growth factor, which is a standard part of the DCF computation, is sometimes referred to as the "VS" growth.

An accurate estimate for the future sustainable value of "r" (return on equity) when multiplied by a value for "b" (retention rate) that is consistent with the selection of the dividend rate and the expected return on book equity, produces a growth rate that is constant and sustainable.

Q. DO STOCK ANALYSTS USE THE "b x r" METHOD?

A. Yes. In the textbook, Investments, by Bodie, Kane and Marcus (Irwin, 1989) at page 478, expected growth rate of dividends is described as follows:

> How do stock analysts derive forecasts of *g*, the expected growth rate of dividends? Usually, they first assume a constant dividend payout ratio (that is, ratio of dividends to earnings), which implies that dividends will grow at the same rate as earnings. Then they try to relate the expected growth rate of earnings to the expected profitability of the firm's *future* investment opportunities.
>
> The exact relationship is
>
> $$g = b \times ROE$$
>
> where *b* is the proportion of the firm's earnings that is reinvested in the business, called the **plowback ratio** or the **earnings retention ratio,** and ROE is the rate of return (return on equity) on new investments. If all of the variables are specified correctly, [the] equation . . . is true by definition, . . .

Q. HOW DID YOU COMPUTE “g”?

A. As previously stated, I used the “b x ROE” method specified in the above textbook quote, although I refer to it in this testimony as the “b x r” method. In the above equation, ROE has the same meaning as "r". I recognized that investors have both historical and forecasted information available to determine the future return on book equity expected by investors. Forecasted data includes not only specific data for a company being evaluated, but also includes overall industry forecasted data. In addition to “b x r” growth, I included a factor to allow for growth caused by the sale of new common stock at a price other than book value.

I have reflected the impact on growth caused by the sale or repurchase of common stock in my recommended growth rate. The computations in support of this estimate are shown on JAR Exhibit 3, Schedule 8.

Q. THERE ARE COST OF CAPITAL WITNESSES WHO CLAIM THAT THE "b x r" METHOD IS SOMEHOW CIRCULAR. THIS IS BECAUSE THE FUTURE EARNED RETURN ON BOOK EQUITY THAT YOU USE TO QUANTIFY GROWTH IS USED TO DETERMINE THE COST OF EQUITY, AND THE COST OF EQUITY IS THEN USED TO DETERMINE THE FUTURE RETURN ON EQUITY THAT WILL BE EARNED. IS THIS CIRCULAR?

A. No. Those who erroneously claim that the method is circular confuse the definition of “r” and the definition of “k”. While “r” is defined as the future return on **book** equity anticipated by investors, “k” is the cost of equity, or the return investors expect on the **market price** investment. Since the market price is determined based upon what investors are willing to pay for a stock, and the book value is based upon the net stockholders' investment in the company, "r" usually has a different value than "k". In fact, the proper application of the DCF method relates a specific stock market price to a specific expectation of future cash flows that is created by future earned return ("r") levels. For example, assume investors are willing to pay $10 a share for a company when the expectations are that the company will be able to earn 12% on its book equity in the future. If events would cause investors to re-evaluate the 12% return expectation, the stock price should be expected to change. If investors' expectations of the future return on book equity change from 12% to 10%, and there is no corresponding change in the cost of equity, the stock price would decline. The cost of equity, however, would not decline simply because an event might occur that would cause investors to lower their estimate for "r". The cost of equity is equal to the sum of both the dividend yield and growth. Investors' estimate of "r" influences the investors' estimate for growth. Changes in growth expectations cause investors to change the price they are willing to pay for stock. A change in the stock price can cause a change in the dividend yield that offsets the change in expected growth. In this way, a higher dividend yield would offset by the lower expected growth rate and leave the cost of equity, "k", unchanged.

Determination of the future return on equity "r"

Q. HOW DID YOU DETERMINE THE VALUE OF "r" THAT YOU USED IN YOUR RETAINED EARNINGS GROWTH COMPUTATIONS?

A. My estimate for "r" for the comparative group of telecommunications companies is a range of 13.0% to 16.00% The value of "r" that is required in the DCF formula is the one that is sustainable into the future for much longer than 5 years.

Determination of Retention Rate, "b"

Q. HOW HAVE YOU DETERMINED THE VALUE OF THE FUTURE EXPECTED RETENTION RATE "b" THAT YOU USED IN YOUR SIMPLIFIED DCF ANALYSIS?

A. I have recognized that the retention rate, "b", is merely the residual of the dividend rate, "D", and the future expected return on book equity, "r." Since, by definition, "b" is the fraction of earnings not paid out as a dividend, the only correct value to use for "b" is the one that is consistent with the quantification of the other variables when implementing the DCF method. The formula to determine "b" is:

$b = 1 - (D/E)$, where

b = retention rate
D = Dividend rate
E = Earnings rate

However, "E" is equal to "r" times the book value per share. Book value per share is a known amount, as is "E", consistent with the future expected value for "r", and the "D" used to compute dividend yield. Therefore, to maximize the accuracy of the DCF method, quantification of the value of "b" should be done in a manner that recognizes the interdependency between the value of "b" and the values for "r" and "D". I directly computed the value of "b" based upon the values of "D", and "r".

Q. WHAT RETENTION RATES DID YOU USE IN THE SINGLE-STAGE DCF METHOD?

A. Based upon the above formula, I used a retention rate for application to the comparative telecommunications companies of 32.63% to 42.33% ... See JAR Exhibit 3, Schedule 5, P. 1.

c) Implementation of Multi-stage DCF

Q. HOW DID YOU IMPLEMENT THE MULTI-STAGE DCF METHOD?

A. The first stage of the model is based upon Value Line*'s* estimates of dividends per share and earnings per share for 2001 through 2005[11] for the companies examined. Value Line does not show a specific earnings and dividend projection for every year from 2000 to 2005. Projections for years skipped by

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[11] The estimate for 2005 is shown by Value Line as its estimate from 2005-2006.

Value Line were made by extrapolation from the available data. When implementing this method, I mechanically used Value Line's projections for the period in which the projections were available.

I determined future earnings in the second stage of the non-constant DCF model by multiplying the future book value per share by the future expected earned return on book equity. For the purposes of this case, I used the same future expected return on book equity that I used in the simplified version of the DCF model.[12] Projected book value equals the beginning book value plus the current year's earnings minus the current year's dividends. Book value growth projections also include the effect of sales of new common stock. The projections in the second stage of the DCF model were made for 40 years into the future. Events longer than 40 years into the future have a minimal present value.[13]

My projections have relied on a constant dividend payout ratio for the second stage[14]. The future constant dividend payout ratio was set equal to the payout ratio for 2002.

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[12] For reasons explained in the discussion of the simplified version of the DCF method, I believe this provides the best estimate of future earnings. However, if the use of a varying array of future expected returns on book equity were supported by the facts, rather than a constant return, the same mathematical model would still be proper to use in determining the cost of equity.

[13] For example, a change in an assumption that the selling market-to-book would be 0.1 lower or higher than as of the time of purchase would introduce a potential inaccuracy in the indicated cost of equity of plus or minus about 25 basis points in a 30-year analysis, but a similar change in the market-to-book ratio expectation would introduce only plus or minus about 15 basis points in a 40 year analysis. If longer than 40 years were used, the result would be even less sensitive to the future market-to-book ratio expectation.

[14] As in the case of the future expected earned return on equity assumption, if there were evidence to support the use of varying payout ratios instead of a constant payout ratio, the same model could still be used to accurately quantify the cost of equity. Unlike the simplified DCF model, this model

I derived the estimated future stock price from the projected book value using the same market-to-book ratio at the time of sale as exists today. The only cash outflow is the price paid for the stock. The non-constant version of the model uses both the spot stock price as of August 31, 2002, and the average stock price for the year ended August 31, 2002 to be representative of the price paid.

The retention rate used in the second-stage was set equal to the retention rate derived from the single-stage DCF. The derivation was used because the decline in the earned return on equity anticipated by investors should be expected to result in a reduction of the future expected retention rate. A decline in the return on equity will result in a decline in the retention rate unless companies cut the dividend rate.

The results for the complex, or multi-stage DCF are shown on JAR Exhibit 3, Schedule 2. As said earlier in my testimony, the result of multi-stage analysis should be expected to overstate the cost of equity because value lines' future expected return on equity from 2002 to 2006 is much higher than investors expect. The simple, or single stage analysis uses a more reasonable 13.00% expected return on equity in the analysis based upon the most current stock prices.

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specifically accounts for the fact that a change in the payout ratio has an impact on the book value, and therefore has an impact on the earnings rate achieved in the future.

Q. WHAT COST OF EQUITY IS INDICATED BY THE IMPLEMENTATION OF THE DCF METHOD IN THIS CASE?

A. As shown on JAR Exhibit 3, Schedule 2, the cost of equity indicated by the DCF method was estimated to be between 9.12% and 10.23% for the group of telecommunications companies, and was between 9.43% and 9.89% for the other groups of companies examined. The wider band of results for the telecommunications companies is the result of the greater difficulty of determining what investors expect for the future for telecommunications companies.

C. RISK PREMIUM/CAPM METHOD

Q. PLEASE EXPLAIN THE RISK PREMIUM/CAPM METHOD.

A. The risk premium/CAPM method estimates the cost of equity by analyzing the historic difference between the cost of equity and a related factor such as the rate of inflation or the cost of debt.

One critically important fact to understand when implementing the risk premium method is that risk premiums have declined in recent years. As mentioned earlier in this testimony, Federal Reserve Chairman Alan Greenspan, made a speech on October 14, 1999 entitled "Measuring Financial Risk in the Twenty-first Century". The text of the speech is available at http://www.bog.frb.fed.us/boarddocs/speeches/1999/19991014.htm. In the speech, Chairman Greenspan stated:

> That equity risk premiums have generally declined during the past decade is not in dispute. What is at issue is how much of the decline reflects new, irreversible technologies, and what part is a consequence of a prolonged business expansion without a significant period of adjustment. The business expansion is, of course, reversible, whereas technological advancements presumably are not.

Q. IS CHAIRMAN GREENSPAN'S VIEW OF THE REDUCTION IN RISK PREMIUMS CONSISTENT WITH WHAT INVESTORS NOW GENERALLY EXPECT?

A. Yes. One good source to confirm that the financial community shares Chairman Greenspan's conclusion is an article that appeared in the April 5, 1999 issue of *Business Week*:

> The risk premium is the difference between the risk-free interest rate, usually the return on U.S. Treasury bills, and the return on a diversified stock portfolio. Over more than 70 years, the return to stocks averaged 11.2%, and T-bills, just 3.8%. The difference between the two returns, 7.4%, is the risk premium. Economists explain this extra return as an investors' reward for taking on the greater risk of owning stocks. **Most market watchers believe that in recent years, the premium has fallen to somewhere between 3% and 4% because of lower inflation and a long business upswing that makes corporate earnings less variable.**

[emphasis added]

On October 4, 2001, the previously referenced report from Credit Suisse First Boston concluded that the equity risk premium over treasury bonds is 3.7%, and the equity risk premium over Baa rated corporate bonds is now 1.9%.[15]

b) Inflation Risk Premium Method.

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[15] Weekly Insights, "Global Strategy Perspectives", October 4, 2001, Credit Suisse First Boston, page 55 and 61.

Q. HOW HAVE YOU APPLIED THE INFLATION PREMIUM METHOD?

A. I implemented the inflation premium method by adding investors' current expectation for inflation to the long-term rate earned by common stocks net of inflation. This result was modified, based upon beta, to obtain a result that was compatible with the risk of the average gas distribution utility.

Q. WHAT IS THE BASIS FOR THE INFLATION PREMIUM METHOD?

A. A book entitled *Stocks for the Long Run*[16] examined the real returns achieved by common stocks from 1802 through 1997. The conclusion in the book is that equity returns in excess of the inflation rate have been very similar in all major sub-periods between 1802 and 1997, while the risk premium in between bonds and common stocks has been erratic. Page 11 of this book states:

> Despite extraordinary changes in the economic, social, and political environment over the past two centuries, stocks have yielded between 6.6 and 7.2 percent per year after inflation in all major subperiods.

The book then says on page 12:

> Note the extraordinary stability of the real return on stocks over all major subperiods: 7.0 percent per year from 1802-1870, 6.6 percent from 1871 through 1925, and 7.2 percent per year since 1926. Ever since World War II, during which all the inflation in the U.S. has experienced over the past two hundred years has occurred, the average real rate of return on stocks has been 7.5 percent per year. This is virtually identical to the previous 125 years, which saw no overall

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[16] *Stocks for the Long Run* by Jeremy J. Siegel, Professor at Wharton. McGraw Hill, 1998. According to the book cover, Professor Siegel was "... hailed by Business Week as the top business school professor in the country...".

inflation. This remarkable stability of long-term real returns is a characteristic of mean reversion, a property of a variable to offset its short-term fluctuations so as to produce far more stable long-term returns.

Continuing on page 14, *Stocks for the Long Run* says:

> As stable as the long-term real returns have been for equities, the same cannot be said of fixed-income assets. Table 1-2 reports the nominal and real returns on both short-term and long-term bonds over the same time periods as in Table 1-1. The real returns on bills has dropped precipitously from 5.1 percent in the early part of the nineteenth century to a bare 0.6 percent since 1926, a return only slightly above inflation.
>
> The real return on long-term bonds has shown a similar pattern. Bond returns fell from a generous 4.8 percent in the first sub period to 3.7 percent in the second, and then to only 2.0 percent in the third.

The book explains some of the reasons why bond returns have been especially unstable. Page 16 says:

> The stock collapse of the early 1930's caused a whole generation of investors to shun equities and invest in government bonds and newly-insured bank deposits, driving their return downward. Furthermore, the increase in the financial assets of the middle class, whose behavior towards risk was far more conservative than that of the wealthy of the nineteenth century, likely played a role in depressing bond and bill returns.
>
> Moreover, during World War II and the early postwar years, interest rates were kept low by the stated bond support policy of the Federal Reserve. Bondholders had bought these bonds because of the widespread predictions of depression after the war. This support policy was abandoned in 1951 because low interest rates fostered inflation. But interest rate controls, particularly on deposits, lasted much longer.

The book then provides a conclusion on page 16 that:

> Whatever the reason for the decline in the return on fixed-income assets over the past century, it is almost certain that the real returns on bonds will be higher in the future than they have been over the last 70

> years. As a result of the inflation shock of the 1970's, bondholders have incorporated a significant inflation premium in the coupon on long-term bonds.

Q. IS IT POSSIBLE TO ACCURATELY QUANTIFY INVESTORS' CURRENT EXPECTATIONS FOR INFLATION?

A. Yes. It has recently become possible to analytically determine investor's expectations for inflation. The U.S. government has issued inflation-indexed treasury bonds. The total return received by investors in these bonds is a fixed interest rate plus an increment to the principal based upon the actual rate of inflation that occurs over the life of the bond. These bonds pay a lower interest rate simply because investors know that in addition to the interest payments, they will receive the allowance for inflation as part of the increment to the principal. This is in contrast to conventional U.S. treasury bonds. The principal amount of a conventional bond does not change over the life of the bond. Therefore, whatever allowance for inflation investors believe they need can only be obtained through the interest payment. By comparing the interest rate on conventional U.S. treasury bonds with the interest rate on inflation-indexed U.S. treasury bonds, the future inflation rate anticipated by investors can be quantified.

Q. WHAT IS THE CURRENT INFLATION EXPECTATION OF INVESTORS?

A. As of August 2002, the inflation expectation of investors was estimated to be about 2.10%. See JAR Exhibit 3, Schedule 9. This was obtained by observing that long-term inflation-indexed treasury securities were yielding 2.62%, while long-term non inflation-indexed treasury securities were yielding 4.69%. The difference between 4.69% and 2.10% is 2.07%. This result was rounded up to 2.10%. Adding this 2.10% inflation expectation to the 6.6% to 7.2% range produces an inflation risk premium indicated cost of equity of 8.70% to 9.30% for an equity investment of average risk.

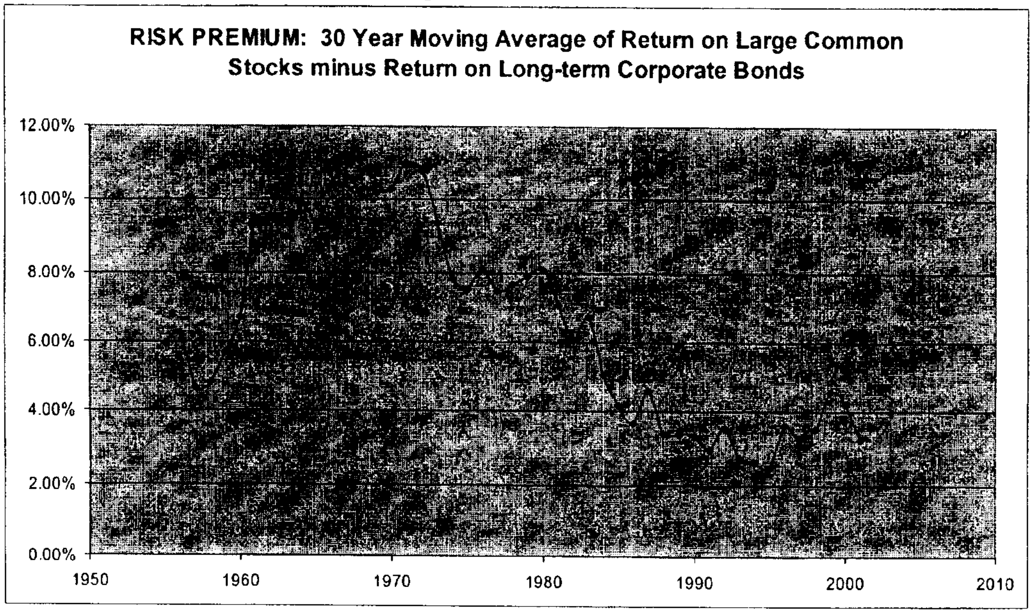
c) Debt Risk Premium Method

Q. HOW DID YOU DETERMINE THE COST OF EQUITY USING THE DEBT RISK PREMIUM METHOD?

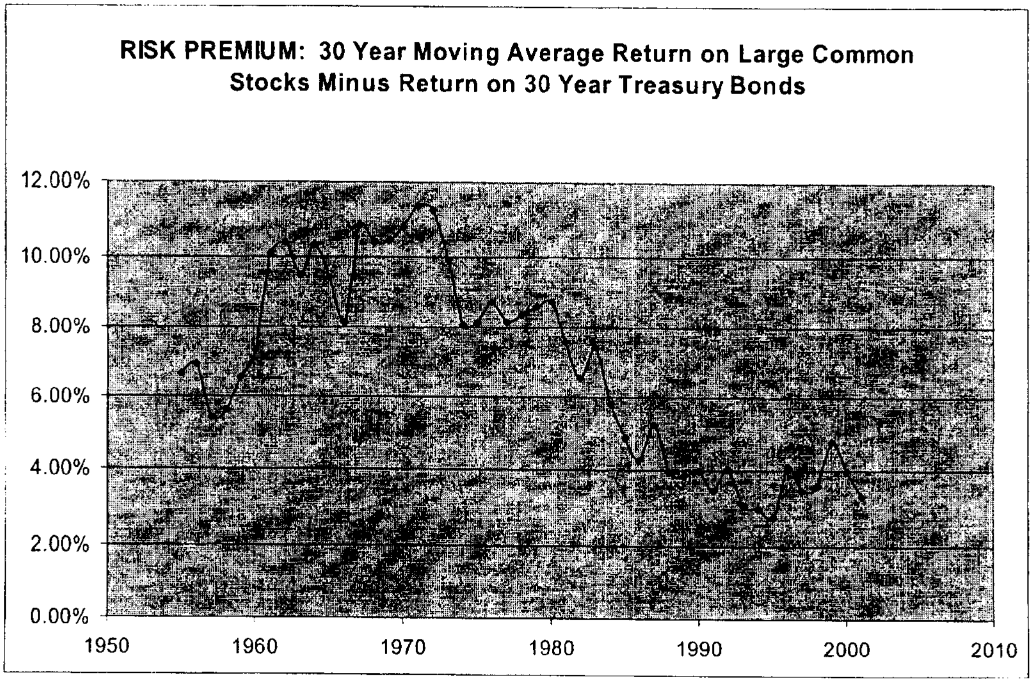
A. As shown on JAR, Exhibit 3, Schedule 10, I separately determined the proper risk premium applicable to long-term treasury bonds, long-term corporate bonds, intermediate-term treasury bonds and short-term treasury bills. In this way, the debt risk premium method I present considers a wide array of data points across the yield curve. In this way, the results are less impacted by a temporary imbalance that may exist in the debt maturity "yield curve".

Q. EARLIER IN THIS SECTION OF YOUR TESTIMONY, YOU NOTED THAT FEDERAL RESERVE CHAIRMAN GREENSPAN STATED THAT THE FACT THAT EQUITY RISK PREMIUMS HAVE DECLINED "IS NOT IN DISPUTE." YOU ALSO PROVIDED SOURCES FROM FINANCIAL LITERATURE CONCLUDING THAT THE RISK PREMIUM IS NOW LESS THAN 4%. DO YOU HAVE ANALYTICAL SUPPORT TO DEMONSTRATE THAT THE STATEMENTS BY CHAIRMAN GREENSPAN AND FROM THE OTHER SOURCES YOU HAVE QUOTED ARE CORRECT?

A. I examined the historic actual earned returns on common stocks and bonds from 1926 through 2000. But, rather than merely making one simplistic computation that examined the entire time period with only one return number over the entire period, I examined a 30-year moving average of the earned returns. 30 years is long enough to see if indeed there is a trend to the earned returns, but not so short as to be overly influenced by the natural volatility in earned returns that generally occurs over just a year or a few years. As shown in the following graphs, the decline in the risk premiums is persistent and undeniable.



RISK PREMIUM: 30 Year Moving Average of Return on Large Common Stocks minus Return on Long-term Corporate Bonds



RISK PREMIUM: 30 Year Moving Average Return on Large Common Stocks Minus Return on 30 Year Treasury Bonds

An examination of the above graphs confirms that a risk premium over 30 year treasuries in the 3 to 4% range is appropriate. For my equity cost computations, I used the conservatively high estimate of 4.0% as the risk premium appropriate to add to U.S. treasuries when determining the cost of equity for an industrial company of average risk. In applying the appropriate risk premium to interest rates other than U.S. treasuries, I determined the average historic risk spread between long-term treasuries and the other interest rate categories I examined. See JAR Exhibit 3 Schedule 10, P. 2. This 4% risk premium was increased or decreased as warranted by the historic data when applied to each of the separate interest rate categories to which I applied the risk premium method.

Q. WHY HAVE YOU CHOSEN 30 YEARS TO SHOW THE DOWNTREND IN THE RISK PREMIUM RATHER THAN A SHORTER TIME PERIOD SUCH AS 10 YEARS?

A. 10 years is far too short of a time period to be able to observe the actual risk premium based upon realized historic returns. The reason that realized returns over a short time are not helpful at quantifying the risk premium is as follows. If the equity risk premium declines, this means by definition that equity investors are willing to settle for a lower risk premium component of the total return they are demanding. If they are willing to settle for a lower return and if other things remain equal, this means that investors are willing to pay a higher stock price for the same future expected cash flow. What this means is that the initial reaction to a lowering of the equity risk premium is for the stock price to rise. A rise in the stock price results in a higher historic earned return; however at the same time the higher stock price means the investor would expect a lower future return. Unless enough years are used in the historic analysis to diminish the misleading impact of the initial response to a reduction in the risk premium, the historic earned returns will not be helpful. I am especially encouraged by the relative consistency of the trend in the lowering of the risk premium as shown in the 30-year data. This reinforces the likelihood that the risk premium has declined as Federal Reserve Chairman Greenspan and many others have observed.

Q. ARE THERE REASONS WHY THE RISK PREMIUM HAS BEEN ON A MULTI-DECADE DECLINE?

A. Yes. One important reason is a lowering of the U.S. capital gains income tax rate. Investors are concerned about the total after-tax return earned. The majority of the return earned by an investor on a long-term bond (and in many cases all of the return earned by a long-term bond investor) is the interest income. Interest income is fully taxed at regular income tax rates. This is in contrast to an investor in common stocks. An investor in the average large common stock has received the majority of their total return in the form of stock price, or capital appreciation. Capital appreciation is not taxed at all until the stock is sold. Then, it is taxed at the long-term capital gains rate if the stock as been owned long enough to be eligible for such treatment. Currently, long-term capital gains are subject to a federal income tax of no more than 20%. This is a considerably lower rate on long-term capital gains than prevailed in prior decades.

Another important reason why the risk premium demanded by common stock investors versus bond investors has declined is because enough years have now passed since the Great Depression that a greater proportion of investors are more comfortable owning common stocks than was the case when the memory of the Great Depression was forefront in the minds of most investors.

Yet another factor is the proliferation of mutual funds. While it is debatable whether the popularity of mutual funds is proof that the risk premium has declined (because more investors are comfortable investing in common stock) or is the reason that the risk premium declined (because mutual fund marketing has increased the availability of investment funds for equity), it is nevertheless a relevant factor.

Q. WHAT COST OF EQUITY IS INDICATED BY THE IMPLEMENTATION OF THE RISK PREMIUM/CAPM METHOD IN THIS CASE?

A. As shown in JAR Exhibit 3, Schedule 2, the cost of equity indicated by the risk premium/CAPM method is 7.97%.

Q. YOU HAVE PRESENTED RISK PREMIUM DATA USING THE GEOMETRIC AVERAGE RESULTS. HAVE YOU SEEN WITNESSES PRESENT DATA USING ARITHMETIC AVERAGE RESULTS?.

A. I have seen some company cost of capital witnesses present risk premium data based upon using an arithmetic average, rather than a geometric average. However, the arithmetic average method is mathematically flawed. If it were used, it would result in a substantial overstatement of the cost of equity. As will be explained in detail later in this section of my testimony, textbooks, the U.S. Securities and Exchange Commission (SEC), and Value Line have all recognized that the only proper way to measure long-term historic actual earned returns is to use the geometric mean. The arithmetic mean is specifically identified has been singled out by several numerous sources as a method that will specifically result in an answer whose absolute value is upwardly biased. The arithmetic average of returns is computed by taking the percentage change over a specific period[17], and computing an arithmetic average of those returns. The geometric average is computed by determining the compound annual average return from the beginning of the period to the end of the period being examined.

Q. PLEASE EXPLAIN WHY YOU HAVE CONCLUDED IT IS IMPROPER TO DEVELOP A RISK PREMIUM BASED UPON HISTORIC ARITHMETIC RETURNS?

A. Arithmetic average returns overstate (on an absolute value basis) the actual returns received by investors. The more variable historic growth rates have been, the more the method exaggerates actual growth rates. Arithmetic average returns ignore the impact of compound interest. For example, if a company were to have a stock price of $10.00 in the beginning of the first year of the measurement period and a $5.00 stock price at the end of the first year, an arithmetic average approach would conclude that the return earned by the investor would be a loss of 50% [($5-$10)/($10)]. If, in the second year, the stock price returned to $10.00, then the arithmetic average would compute a gain of 100% in the second year [($10-$5)/($5)]. The arithmetic average approach would naively average the 50% loss in the first year with the 100% gain in the second year to arrive at the conclusion that the total return received by the investor over this two year period would be 25% per year [(-50% +100%)/2 years]. In other words, the arithmetic average approach is so inaccurate that it would conclude the average annual return over this two-year period was 25% per year even though the stock price started at $10.00 and ended at $10.00.[18] The geometric average would not make such an error. It would only consider the compound annual return from the beginning $10.00 to the ending $10.00, and correctly determine that the annual average of the total returns was not 25%, but was zero.

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[17] Frequently arithmetic average returns are computed based upon annual results. However, arithmetic returns could be computed using any other time – daily, weekly, monthly, every two years,

In order to protect investors from misleading data, the United States Securities and Exchange Commission ("SEC") requires mutual funds to report historic returns by using the geometric average only. The arithmetic average is not permitted. The geometric average, or SEC method, has the compelling advantage of providing a true representation of the performance that would have actually been achieved by an investor who made an investment at the beginning of a period and re-invested dividends at market prices prevailing at the time the dividends were paid.

Q. DOES THE FINANCIAL COMMUNITY COMPUTE HISTORIC ACTUAL ACHIEVED RETURNS BASED UPON ARITHMETIC MEANS OR GEOMETRIC MEANS?

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every 5 years, etc. and then converting that result to an average annual return.

[18] The same would be true had the stock ended the first year at a price of $20, then returned to a price of $10 at the end of the second year. In that case, the arithmetic mean would also suggest an average

A. The financial community (as represented by reflected in articles from *The Wall Street Journal* and from *Business Week* that are specifically quoted in this testimony) refers to geometric averages when evaluating historic returns. Additionally, page 92 of the August 16, 1999 issue of *Fortune* magazine refers to the return that is equal to the geometric mean from Ibbotson Associates as "...the oft-quoted calculation..." of historic actual returns on common stocks. The article does not even mention the number that is equal to the historic arithmetic return.

Q. DO FINANCIAL TEXTBOOKS SUPPORT THE USE OF THE GEOMETRIC AVERAGE FOR COMPUTING HISTORIC ACTUAL RETURNS?

A. Yes. For example, the textbook *Valuation. Measuring and Managing the Value of Companies*, by Copeland, Koller, and Murrin of McKinsey & Co. , John Wiley & Sons, 1994, provides what is essentially the identical example to the one I presented earlier, but it does so specifically in a description of how to use the Ibbotson Associates data. The textbook gives a similar example to the one I explained earlier in this section of my testimony, when it states the following on pages 261-262:

> We use a geometric average of rates of return because arithmetic averages are biased by the measurement period. An arithmetic average estimates the rates of return by taking a simple average of the single period rates of return. Suppose you buy a share of a nondividend-paying stock for $50. After one year the stock is worth $100. After two years the stock falls to $50 once again.

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annual return of 25%, when it is self-evident that the average annual return is zero, the exact result produced by use of the geometric mean.

> The first period return is 100 percent; the second period return is -50 percent. The arithmetic average return is 25 percent [(100 percent - 50 percent)/2]. The geometric average is zero. (The geometric average is the compound rate of return that equates the beginning and ending value.) **We believe that the geometric average represents a better estimate of investors' expected returns over long periods of time.**

(Emphasis added)[19]

Note that the Copeland who was one of the authors of the above statement is also Tom Copeland, the name on the article cited by Dr. Vander Weide in Appendix A of his direct testimony.

In another textbook discussion that specifically addresses the use of the Ibbotson data, *Financial Market Rates & Flows*, by James C. Van Horne, Prentice Hall, 1990, states the following on page 80:

> The geometric mean is a geometric average of annual returns, whereas the arithmetic mean is an arithmetic average. For cumulative wealth changes over long sweeps of time, the geometric mean is the appropriate measure.

The textbook *Investments* by Nancy L. Jacob and R. Richardson Pettit, Irwin, 1988, puts it well when it says:

> The existence of uncertainty as reflected in a distribution of possible values makes the **expected value**, or arithmetic average rate of return, a misleading and biased representation of the wealth increments which will be generated from multiperiod investment opportunities.
> The average *annual* rate of wealth accumulation over the investment period, termed the **average annual geometric rate of return**, correctly measures the average annual accumulation to wealth when multiple periods are involved.

(Emphasis is contained in the original)

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[19] Note that the Copeland who was one of the authors of the above statement is the author of the article relied upon by Dr. Vander Weide in Appendix A of his direct testimony.

Q. WHAT HAS VALUE LINE SAID ANYTHING REGARDING THE USE OF AN ARITHMETIC AVERAGE OR A GEOMETRIC AVERAGE?

A. Yes. On May 9, 1997, Value Line issued a report entitled "The Differences in Averaging". This report was contained on pages 6844-6845 of the "Value Line Selection & Opinion" portion of its weekly mailings to subscribers. This report says that:

> (t)he arithmetic average has an upward bias, though it is the simplest to calculate. The geometric average does not have any bias, and thus is the best to use when compounding (over a number of years) is involved.

The Value Line report then goes on to provide examples that show why the arithmetic average overstates the achieved returns while the geometric average produces the correct result. A complete copy of this Value Line discussion is included with this testimony as JAR Exhibit 6.

Ibbotson Associates has also said in the past that it is the geometric average that is "the correct average to compare with a bond yield."[20]. More recently, since after Dr. Ibbotson began testifying as a cost of capital expert for telecommunications companies, he began arguing for the use of an arithmetic average. In his Valuation Edition 2002 Yearbook of *Stocks, Bonds, Bills, and Inflation*, he presents an example to illustrate why he supports the use of the arithmetic average. This example appears on page 73. However, Dr. Ibbotson's example is invalid because it heavily relies on two assumptions that are incorrect. One assumption is that investors have the same amount invested every year, and the other is that each year's performance is independent of the prior year's performance.

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[20] Page 75 of Stocks, Bonds, Bills, and Inflation 1986 Yearbook.

Dr. Ibbotson's implied assumption that the same amount is invested in each year is the same. In reality, it is not. Anyone who doubts investments are not equal only needs to consider the behavior of the NASDAQ in recent years. Those investors whose retirement accounts were heavily invested in the tech stocks of the NASDAQ have declined substantially in value. The NASDAQ index reached an all time high of 5,132.52 in March 2000. The high for the NASDAQ was 2,243.78 in March 2001, and the high for the NASDAQ in March 2002 was 1,946.23. As I write this testimony today, the NASDAQ index is 1,330. There are millions of investors who are disappointed about this because they lost a considerable amount of their savings. If an investor had carefully saved for years so that he or she had accumulated $100,000 in their retirement account as of March 2000, if it were invested in the NASDAQ, the investment would have declined to about $43,716.93 in March 2001, to about $37,919.58 by March 2002, and would be currently worth only $25,913.20. In order for this all-too-common, but very unfortunate investor to get back to where he or she was in March 2000, the NASDAQ would now have to grow from its current level of 1,330 all the way back to 5,132.52. This "recovery" would require a gain of 286%. The percentage loss experienced by this investor was 56.28% from March

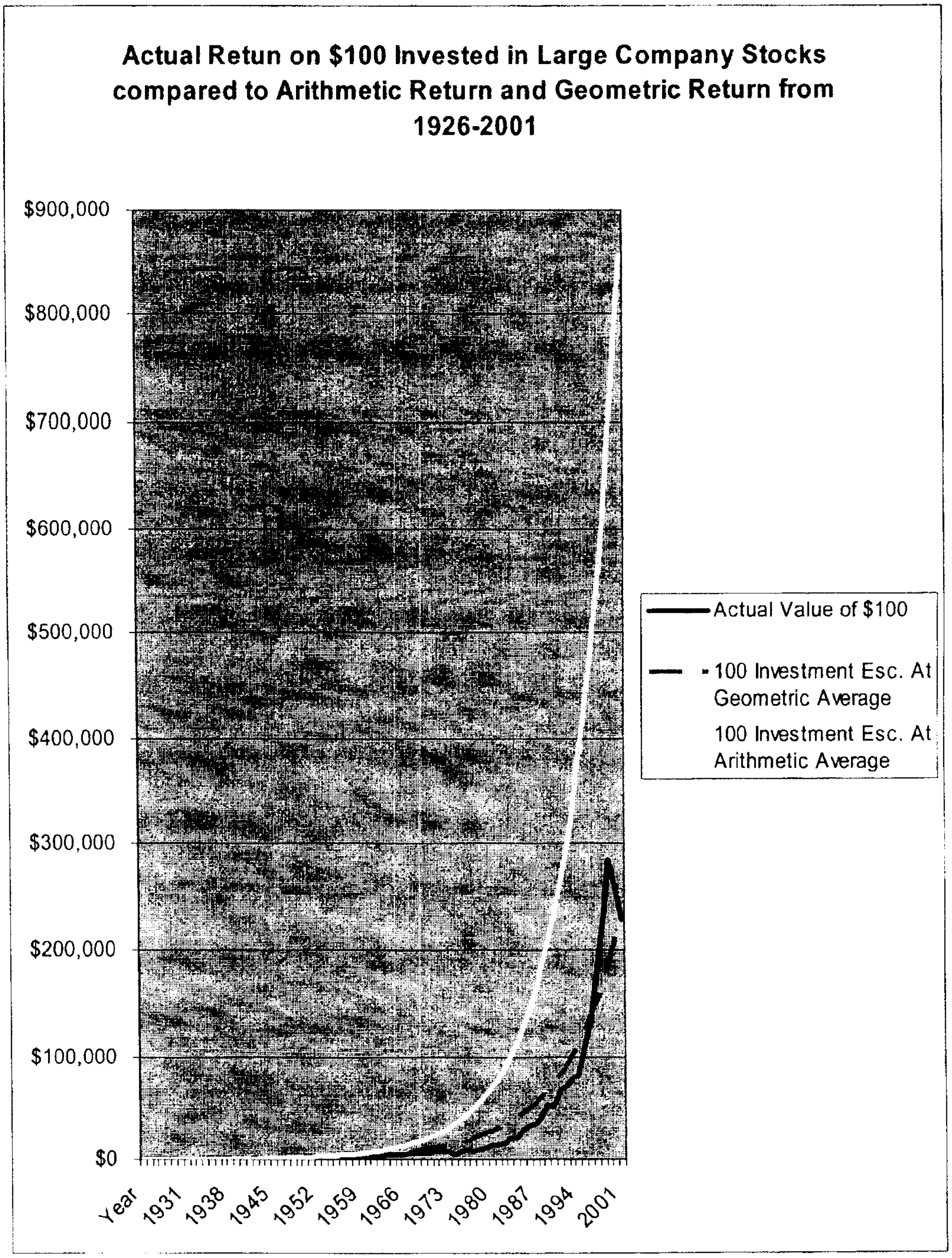
2000 to March 2001, was another 13.26% from March 2001 to March 2002, and was another 31.66% from March 20021 to present. If these three returns are combined using the arithmetic average, then the investor would say he or she lost a combined total of 101.2% in the roughly 2 ½ years since March 2002, for an average loss of 40.48% per year.101.20% in the roughly 2 ½ years since March 2002. This is, of course, a ridiculous conclusion because as bad as the losses were to this poor investor, the investor still has $25,913.20 remaining out of the original $100,000.Note that from the perspective of the inherently flawed arithmetic average method, the percentage gain to get back to 5,132 is over twice as high as the percentage losses Yet, based upon the arithmetic average method, the investor would have lost more than the original investment. Also note that the arithmetic average averages the total losses in the period that are greater than 100%. Were losses really greater than 100%, no even though they were from the perspective of the number that the arithmetic average uses as the sum of the losses when computing the average. What is wrong with the arithmetic average? Simply, by putting everything in terms of annual averages rather than absolute numbers, the method incorrectly and unrealistically assumes that the investor had the same dollar amount invested in each period. Yes, our hypothetical investor would have lost 101.20% of the original investment if he or she had replaced each years' lost funds by reinvesting into the retirement account. For most people, they simply do not have the extra money to make the reinvestment possible.

The absurd result from using the arithmetic averaging technique in a realistic real world example should be taken one step further. Suppose the NASDAQ should stage a remarkable rally and recover to its old high by March 2003 (no, virtually no one expects this, as the NASDAQ bubble is now a generally accepted phenomena). If it should stage such a recovery, the gain in the NASDAQ from March 2002 to March 2003 would be 163.72%. The investor who went through this roller coaster ride would have started with $100,000 and ended with $100,000. The geometric averaging method would correctly recognize that the annual average return received by this investor was zero even though it felt like a wild roller-coaster. The user of the arithmetic average method would average the 56.28% loss with the 13.26% loss and the 163.72% gain to reach the incorrect conclusion that the investor achieved a return of 77.75% per year even though the investor started out with $100,000 and ended up with $100,000. Note that this example only varies in concept from the erroneous one presented by Dr. Ibbotson in his book is that it recognizes it is not proper to assume that an investor starts out at the same dollar level of investment each year. In the real world, investors tend to invest more and more in the stock market when it goes up, and tend to panic and cash in their investments when the markets go down. This real world reaction is exactly the opposite of what would have to be done in order for investors to achieve the arithmetic average results. In the real world, many people sell their investments when stocks are down and miss out totally on the rise, while others do add to their investment. Furthermore, in an up market, the amount invested gets bigger each year, as investors tend not to take their gains "off the table," Moreover, in a down market, the amount invested decreases, since investors tend not to replenish their declining investment so as to restore the dollar amount to where it was. Since in aggregate investors cannot and do not outsmart "the market", the only proper way to examine the return in multiple periods, whether those returns are historical or prospective, is to consider the geometric average return.

Q. HAVE YOU COMPARED GRAPHICALLY THE CAPITAL APPRECIATION GROWTH RATE USING THE ARITHMETIC AVERAGE METHOD WITH THE CAPITAL APPRECIATION GROWTH RATE THAT IS OBTAINED USING THE SEC METHOD?

A. Yes. In the following graph I show the actual movement of the S&P Utility index from 1928 through 1998. I also show how the index would have behaved on a year-by-year basis using the average growth obtained from the SEC method and using the arithmetic average historic growth rate methodology. The graph illustrates that arithmetic average calculation of historic actual returns deviates at an ever-increasing rate over time from the actual S&P Utility Index, overstating the total return from 1928-1998 by almost 400%. By contrast, the historic actual returns computed using the SEC method is a dramatically more reasonable track of the growth of the S&P utility over time and thus is a better measure of historic actual return rates realized by investors.

In the following chart, the actual return on the Large Common Stocks is the line towards the bottom of the graph that is not smooth, the line towards the bottom of the graph that is near the actual return line is the geometric return on the Large Common Stocks and the line that is much higher than the other two lines is the arithmetic return.


Actual Retun on $100 Invested in Large Company Stocks compared to Arithmetic Return and Geometric Return from 1926-2001
$900,000
$800,000
$700,000
$600,000
$500,000
$400,000
$300,000
$200,000
$100,000
$0
Year
1931
1938
1945
1952
1959
1966
1973
1980
1987
1994
2001
Actual Value of $100
100 Investment Esc. At Geometric Average
100 Investment Esc. At Arithmetic Average

In the above chart, the top line shows that if $100 had been invested in public large common stocks in 1926 through 2001 and had earned the arithmetic return, the $100 would have grown to over $800,000. The lower irregular line shows what actually would have happened to a real $100 investment if it had been invested in public utility common stocks. As shown on the graph, the $100 investment would have actually grown to about $225,000. While the increase from $100 to $225,000 is a very sizeable return, it is far less than the $800,000 return that would have been achieved if the arithmetic return methodology had been achieved. The smooth line that ends at the same place as the actual return line is the ongoing value of $100 invested in 1926 that grew at the geometric return rate. Note that the $100 invested at the geometric return rate is, by 2001, exactly equal to the actual return. Therefore, the geometric return accurately measures the actual return that was achieved from 1926 through 2001, but the arithmetic average return exaggerates the actual return by more than 3 times.

Q. HOW MUCH HIGHER IS THE RISK PREMIUM DIFFERENCE BASED UPON AN ARITHMETIC AVERAGE THAN IT IS BASED UPON A GEOMETRIC AVERAGE?

A. From 1926 to 2001, the arithmetic average method produced an indicated risk premium that was about 2.5% higher for large company stocks versus long-term corporate bonds than the risk premium indicated by using the SEC, or geometric average method.